

## THE FERAL GOATS OF LOCH LOMONDSIDE, WITH PARTICULAR REFERENCE TO THE INVERNSNAID GROUP

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### PURPOSE OF THE STUDY

The R.S.P.B. study (1994) reached the following conclusions with regard to the antiquity, origin and type of the Loch Lomondside feral goat population:

- Possibly the oldest record of feral goats in Britain actually appertains to the Inversnaid area, this being a reference to the fourteenth century story linking Robert the Bruce to feral goats at that time.
- Feral goats would not have been tolerated in the Loch Lomondside area between around 1700 and 1920, the period when the woodlands were intensively managed for timber, charcoal and tanbark.
- It is probable that the present day feral goat herds originated around the turn of the twentieth century.
- Milking goats were liberated to join the Loch Lomondside herds at the end of the Great War, and at least three domestic animals were introduced to the Inversnaid population during the 1980's.
- There is no reason to believe that the Inversnaid population is any more or less pure than any other feral goat population.
- When introgression occurs, it is impossible to recognise domestic links in a very short space of time, it being regrettable that pelage patterns offer little evidence as to the origins of feral goat populations, or indeed as to the length of their existence.
- As suggested by Darling (1937) feral goats will revert to a wild type in a very short space of time.
- Neck tassels are present on some Inversnaid animals, and many consider this feature to be indicative of more recent feral goat populations.

Although the foregoing was presented as isolated statements in varying contexts under varying headings, it is possible to draw them into one statement that covers the only known study dealing with all aspects of the antiquity, origin and type of the Loch Lomondside feral goat population. This is paraphrased and interpreted as:

Quite possibly, the oldest records of feral goats in Britain pertain to the Inversnaid area, although the intensive management of woodlands between 1700 and 1920 would have *almost certainly* meant that feral goats were *not tolerated* in the Loch Lomondside region for a period in

excess of two centuries, thus breaking any possible historical links between, and continuity with, these earlier records.

The conclusion reached, therefore, is that the present feral goat populations originated around the turn of the twentieth century, and although having a known continuous history in excess of one hundred years, the release of milking goats in 1918, and the further release of domesticants of Modern type in the 1980's, has resulted in introgression of the original stock with goats of improved type early on in the populations' more recent history.

Although the general history of the goats is considered to be quite straightforward with regard to documented sources and personal knowledge, this being summarised as a long but discontinuous history, marked by contamination by stock of improved type- what may or may not be learned from a study of phenotype is ambiguous. Most certainly, the presence of tassels in some animals would *suggest* that the goats have a more recent origin, whilst pelage patterns offer *little evidence* with regard to either the origin of these goats or the length of their existence.

Referencing the research of Darling (1937) it is acknowledged that domestic goats will revert to a wild type in a very short space of time, so that it would be virtually impossible to recognise any domestic goat links in the Loch Lomondside population if releases or escapees have been intruded as recently as ten years ago. Thus, the phenotype of the Loch Lomondside population will have an appearance of antiquity, with a standard feral goat phenotype, irrespective of the proportion of introgression and how recently it happened. There is therefore no reason to believe that the Loch Lomondside population is any more or less pure than any other feral population, another way of disclaiming any possibility of proving that the Loch Lomondside goats are on a cline between pure Old British Primitive goat and mainly domestic stock of Modern improved type.

The following consequence could be added as a rider to the above:

This, of course, would apply to any feral goat population if it were true of the Loch Lomondside stock, and devalue our surviving feral goat populations as possible survivals of an early and primitive breed worthy of preservation; one which would be on a par with the Soay sheep with regard to antiquity and both historical and agricultural importance.

The purpose of the present study is to both take a close look at the historical evidence and to research the phenotype of the Loch Lomondside feral goat population, using the

information gained to reevaluate the eight conclusions, quoted above, of the RSPB report of 1994.

## ORIGIN AND HISTORY OF THE LOCH LOMONDSIDE FERAL GOAT

### NINETEENTH CENTURY DESCRIPTIONS OF THE OLD SCOTTISH GOAT

The Old Scottish goat is at best a variety of the Old British goat, the only breed found in the British Isles from the earliest introduction of livestock to the late eighteenth century, when breeds from mainly Africa, the Middle East and Asia began to trickle in by way of the larger seaports. European breeds of mainly Swiss type and origin supplemented these in the late nineteenth and early twentieth centuries.

According to Pegler (1875), the author of the first book in the English language that was devoted entirely to the subject of the goat, Scottish and Irish goats closely resembled each other, the only difference being in point of size, the Scottish being rather smaller. He offered no description of the Scottish goat at this time, but remarked that the Irish were mostly large animals with long shaggy coats. They were generally of a mixed black and white colour, with rather short ears and horns that pointed upwards. Overall, their appearance was said to have been by no means prepossessing. Pegler's observations were a reprint of a series of articles that had appeared in the *Bazaar, Exchange And Mart* in 1873, the time when, according to him, 'large numbers are imported from Ireland annually into this country'. Although Pegler wrote that in Great Britain each country seemed to have its own variety of goat- as in Irish, Scottish, Welsh and English- he made it clear that not only did the Irish and Scottish resemble each other closely, but also that the English resembled these two in similar measure. As he put it: 'I have seen many goats that were called English but which as much resembled the Irish and Scottish as these animals themselves'.

Pegler again, but in the third (1886) edition of his *Book of the Goat*, described the Scottish goat as being small, long-haired and with large horns that grew back in a graceful curve towards the rear like those of the Ibex or Wild Goat. He considered the ears to be sharply "pricked", and there was a tuft of hair over the forehead like that found in Highland cattle.

Bird (1910) offered a fairly detailed description of the Scottish goat. His 'pure-bred Scottish goat' had a shaggy coat, and was a small and extremely active animal. The coat was longer than that found in the Welsh, and the horns larger and curving gracefully backwards. The forehead was fringed or tufted, and the ears were said to have been more like those found upon the Scottish sheep than of 'the heavier type usually seen in the goat'. Bird compared the Scottish goat with the Highland breed of cattle, stating that it 'admirably matched' the Highland, the resemblance probably being due in a measure to the similar conditions of locality and climate that these two classes of animals had to face. Indeed, he speculated that if the breed had been persistently bred in England, it would probably have lost in a great measure its characteristic coat.

### Introduction

Gibson (1954, 1972) regarded the Loch Lomond, Loch Ard and Ben Venue goats as three parts of what he termed an extended colony. Whitehead (1972) mentioned that goats were reported at Corriegrennan, which is about halfway between Ben Lomond and Ben Venue, whilst Gibson, same year, stated that goats often used to be seen in the Loch Ard area, apparently travelling between the two Bens. From this information, Gibson deduced that there was obviously some interchange between the two colonies.

In 1994, there were three centres of population in the Loch Lomondside area. This centred on the Inversnaid population, with tentatively associated populations of feral goats to both the north and the south. In the past, these populations have been known as the "Stirling" population, and, in 1972, was considered by Whitehead to number between seventy and one hundred, a figure close to Greig's one hundred of 1968 (Greig, 1970), with no more than twenty-five of these being in the Inversnaid area. Between three hundred and three-hundred-and-fifty goats of the Stirling population had been culled by the Forestry Commission the 1960's, and the total population was put at around three hundred in 1983 (information from R.J. Sater, quoted in Hellawell, 1994). The total Loch Lomondside population was put at around three-hundred-and-fifty goats in 1994. This included around two hundred animals to the south (Ben Lomond) and fifty animals to the north of Inversnaid at an as yet unidentified location.

Although there was, in the early 1990's, a scarcity of information concerning emigration and immigration, it was suggested that movements to and from these neighbouring populations were very restricted (Hellawell, 1994), although there were records of new animals appearing elsewhere. This was considered rare, however, and in general the Inversnaid population was thought of as being relatively sedentary. One factor that restricts movement in and out of Inversnaid from the south is a deep ravine (Arklet Water) combined with a deer fence. Likewise, a new stock fence to the north was anticipated to reduce goat movement in or from that direction. Even so, Hellawell qualified these statements by pointing out that in the case of the Inversnaid population there was hard evidence that some inward migration of animals from neighbouring herds did occur. This was thought to be infrequent as occurrences, but more than adequate to maintain the diversity of the gene pool.

### Glen Falloch

Gibson (1954, 1972) stated that goats had then been known to frequent the hills of Glen Falloch, to the north of Loch Lomond, for at least one hundred years. Anderson (1952) gave a good description of the herd as it existed in 1899, the number then being around a dozen (ten to twelve) animals. Anderson indicated that the goats were fairly wide-ranging, including the slopes of Beinn Chabhair, and the neighbouring Braes of Balquhiddier. He saw this "little herd" on ten occasions over a six-month stay in the area, and described them as being all of the same dull grey colour. The one grown male was a handsome animal with a fine pair of horns. They did not mingle with the sheep,

although the sheep and the goats were in no way shy of each other. Gibson confirmed that, around seventy years later, it was certainly still the case that the Glen Falloch goats did not seem to stay long in any one particular place. Gibson also believed that a comment made by Anderson in relation to the goats and sheep was of particular interest, as it suggested the exact opposite of the usual relationship claimed between these two species. The comment was that the local shepherds "did not like the wild goats coming about, for the sheep were liable to follow the goats' example in seeking tempting tufts of green on dangerous ledges, and sometimes sheep had to be rescued from places from which they could not extradite themselves". Gibson saw only one goat in the locality in 1971, although he did not search further east and believed that others were "temporarily absent". Whitehead (1972), made no reference to the Glen Falloch goats by this name, but commented that from time to time since the late nineteenth century, goats have been seen on mountains between Glen Falloch and the Braes of Balquhider, including Beinn Chabhair, but seldom seem to stay long.

### Inchloaig

Buchanan Smith (1932) commented that "as to whether there still exist wild goats on the islands of Loch Lomond is a bit uncertain". Boyd Watt (1937) wrote of a tradition that wild goats inhabited the yew-tree island, Inch Lonaig, on Loch Lomond, whilst Gibson (1972) noted that this was more than a tradition. Colquhoun (1841) gave a rather graphic description of goat stalking on this island, which centred on a particular precipice that had been called from time immemorial Crap-na-gower, or the Hill of the Goats. Colquhoun made the interesting comment that at the time he was stalking the herd, the herd itself was deteriorating, "the fine old wild ones having been killed off, and some of the tame kind substituted to cross the breed". It was also Colquhoun's view that the original goats were a breed between the Welsh and the Highland, and were very large. Inhabitants did not recollect when they had been introduced, although Paterson (1893) commented that about the middle of the seventeenth century, Inchloaig was laid waste for use as deer forest, its condition until the time he wrote, and that in the following century (the eighteenth) fifteen Highland goats were introduced onto the island. It was the descendants of these goats that remained on the island in a wild state for a long period thereafter. By the time that Paterson wrote in 1893, the goats were extinct, only fallow deer being found there at that time. According to the *British Association Excursion Handbook*, number 6, published in 1928, the yew trees were said to have been planted on the instructions of King Robert the Bruce to supply bows for archers. This is mentioned as it has been suggested that the goats were exterminated because of their destruction of the yew trees. Hansard (1841) has refuted any idea that yew trees were planted on the island to furnish bows, however, stating that a yew tree would hardly supply a half dozen staves over a period of a century's growth. Gibson confirmed that there were no feral goats on Inchloaig in 1972, adding that he knew of no other islands in Loch Lomond where they occurred.

### Achray

Watt (1937) treated the Ben Venue and Achray goats as separate populations. His reference for Ben Venue is Buchanan Smith, who does not mention Achray. Watt's reference for Achray is Wallace (1923) who stated in his appendix V the following: Three heads of bucks, shot from this flock on Achray, Callander, are shown in plate CCXXXIII. b. These billies were shot by Captain R.T. Hinckes, of Foxley, Hereford, game tenant, 1922. "This flock" refers to having just discussed the Ben Venue goats, so it is evident that Wallace himself regarded the Achray and Ben venue goats as one flock. The published photographs of these billies in Wallace clearly show goats of the Old British, and therefore not Modern, type.

### Ben Venue

According to Buchanan Smith (1932), the goats on Ben Venue were mentioned by the poet Southey, who refers to them as having become wild. In 1819, there were about forty of these goats. Gibson (1972) elaborated on Southey's reference to both Ben Venue and the goats in the poet laureate's journal. According to Southey "last year the Duke of Montrose sold the woods on Ben Venue, which was then completely clothed with fine trees, for the paltry price of £200. It seems incredible that for such a sum he should have incurred the obloquy and the disgrace of disfiguring, as far as it was in his power to disfigure, the most beautiful spot in the whole island of Great Britain. There are goats upon Ben venue, which have become wild, but are still considered private property. The boatman supposed them to be about forty. I wish they may be allowed to multiply. The extirpation of wild beasts from this island is one of the best proofs of our advanced civilization, but in losing those wild animals from which no danger could arise, the country loses one of its great charms."

Gibson (1972) confirmed that the Ben Venue goats had most certainly been known for generations, but added that their fortunes had fluctuated a great deal. At least fifty had been counted in 1898. In 1913 there were at least thirty. From this point onwards, a considerable increase took place, and there were probably around one hundred in the herd by the late 1930's. It is evident that billies from the Ben Venue herd were trophy shot in the last century, as apart from the Achray reference above, a head from an Achray goat is recorded as a trophy in *Records of Big Game* (Ward, 1928), and in the 1920's and 1930's, the columns of *The Field* magazine contain several records of goat heads shot on Ben Venue. It is said that a few of the Ben Venue goats used to be white, and the billy shot on the Ben on 31<sup>st</sup> August, 1922, with horns twenty-eight-and-one-half-inches long, thirty-three inches wide, tip to tip, and seven-and-one-half-inches in circumference at the base, was of this colour. There was considerable shooting of these goats during the Second World War, their number having been reduced to thirty by 1945. Gibson (1972) could find only a half-dozen scattered goats over the whole area in 1950, and Whitehead (1972) put their number at eight in 1951. Gibson believed that the herd was by then virtually extinct, and Whitehead stated that, by 1959, only one nanny and her kid remained. Between the early 1950's and the early 1970's, Gibson had

only a very few records of goats in the Ben Venue area. However, in 1970 and 1971, he saw three goats on Ben Venue, and was told locally that there were "quite a few back now". Quite what this meant was a puzzle to him.

Buchanan Smith commented, in 1932, that as many as fourteen had been seen recently, amongst which were two black ones, one of these being a kid.

Wallace (1923) stated in appendix five of his *Farm Livestock of Great Britain* that "on the authority of Mrs. Duncan Ferguson, seventy-nine years of age, a Gaelic-speaking native of the Brig of Turk district, wild goats, mostly light grey but some dark brown, have existed on Ben Venue since she remembers, and for generations before her time".

Grieg (1970) commented that the Forestry Commission was responsible for both exterminating the Ben Venue population and drastically reducing the numbers of the Ben Lomond population. Whitehead (1972) confirmed the culling of the Ben Venue goats by the Forestry Commission.

### **Ben Lomond**

Due to the Robert the Bruce tradition, Whitehead (1972) ascribed a six hundred year history to the Ben Lomond goats (see under Inversnaid). He went on to state, however, that the present stock appears to have a more recent origin.

According to "local History", as Gibson phrased it, the Ben Lomond goats were virtually exterminated round about the turn of the twentieth century. They were re-established by local domestic goats going wild or being liberated. Whitehead (1972) tells a similar story, stating that at the beginning of the twentieth century, there were only a few goats in the area, the present stock being descended from domestic goats originally kept at Inversnaid and French.

Gibson (1972) stated that the fortunes of the Ben Lomond goats have fluctuated enormously. Before the Second World War, the population of the herd was considered to have been at least two hundred and fifty animals, (Whitehead put it at over three-hundred) but both during and after the war, the Forestry Commission considerably reduced their numbers. Fifty were seen in 1947 (Airey, 1948), although Gibson counted barely forty in 1951. Whitehead, however, put the total in 1952 at about seventy to one hundred. From this point onwards their numbers slowly increased again, and during the 1960's the herd seemed to have numbered about one hundred goats. It was remarked, however, that they were so often widely scattered that it was sometimes far from easy to be sure of an accurate count.

Milking goats released from the disbanded First World War army camp near to Loch Ard are said to have joined the Ben Lomond goats.

At the time that Greig made his study of the Ben Lomond goats, in the late 1960's, a Forestry Commission drive was organized to round up a number of goats and to relocate them in Glen Nevis. Seventeen in all were captured, although the removal did not take place as it was decided

that the goats could not be removed from one conservancy to another, this contravening a Forestry Commission regulation. These goats were re-released on Ben Lomond, and as it was felt that there were too many here, a cull by shooting was organized for the near future.

For Greig (1970), the fact that he encountered a significant number of Ben Lomond goats with tassels tended to confirm that there had been some Modern genetic stock added. Establishing the origin of this introgression proved to be difficult, however, as the older inhabitants of the area had either moved out or died by the time he carried out his study. By relying on second-hand information, he learned from a member of the Nature Conservancy staff, who had in turn heard it from an old farmer, that it was the practice until at least the 1920's to add new billies to the feral stock to "improve" the "blood". These billies were apparently purchased at the local mart, and Greig speculated that this might have been how the tassels came to be found in the Ben Lomond population during the 1960's. Greig appears not to have heard the story of the Loch Ard army camp during the Great War, and billies introduced prior to the 1920's are as likely to have been of the Old British primitive breed as of Modern type. Even had goats of Modern type been introduced on occasions prior to 1918, it is at the least probable that the Loch Ard introduction would have to all intents and purposes swamped the existing stock with Modern characteristics by comparison.

A coloured photograph, published source unknown, but dating to the 1960's, shows two kids on Ben Lomond "one thousand feet above sea level". Both appear to be basically black, although there is considerable grizzling, which affects the tail, quarters, neck and chest, face and forehead. This is difficult to interpret as a colour pattern, although feral kids born black with grizzling in other populations have been observed to mature as black goats. Whether this grizzling is actually a roan, and therefore white hairs, or a dilute tan is hard to say, although the latter is the more likely. There is a colour pattern that is a roaning of tan and black hairs, called mahogany (Amh- also called sooty in sheep), this being an even distribution of the eumelanin and pheomelanin hairs throughout.

Gibson (1972) counted 106 goats in 1971, twelve of which were pure white, whilst Whitehead gave a "recent" estimate of their numbers in 1972 as being 140-200.

Whitehead considered their "headquarters" to be on the steep eastern scarp from Rowardennan to about the county boundary (Stirling-Perthshire) beyond Inversnaid. The main concentration was located near to Ptarmigan; they were also seen on Craig Rostain. Also see Gibson and Mitchell (1986).

It was estimated that there were around two hundred goats in the Rowardennan/Ben Lomond population in 1994 (Hellawell, 1994).

### **Inversnaid**

Goats at Inversnaid are said to possess the longest pedigree of any feral herd in Scotland, and Buchanan Smith (1932) asserted that they could even be termed "royal". He quoted

the story of how, in the fourteenth century, King Robert the Bruce was fleeing from his enemies and hid in a cave in Inversnaid. Whilst he was there, some wild goats came and lay down at the entrance. His pursuers, seeing the goats, believed that Bruce could not be in the cave and passed on. The King then issued a decree that the wild goats should never be molested.

It is known that at least three domestic goats have been introduced into the Inversnaid population, all seemingly in the 1980's.

In 1994, the population consisted of seventeen males, forty-six females and twenty-six kids, a total of eighty-nine animals (Hellawell, 1994).

### **Loch Ard**

On the southern slopes of the hill at Ledard, which lies to the north side of Loch Ard, the incoming tenant in the year 1875 was required to pay valuation prices for more than twenty goats. They were not actually produced at the time of the tenancy agreement, but were certified to be on the hill. Even so, these goats never came in with the sheep at the time of the gatherings, but during the hard winter of 1878-9, they were brought in to be fed but refused to eat and had to again be given their liberty. These goats, according to Buchanan Smith, (1932) were supposed to nibble the green sprouts in dangerous cliff areas, so as not to tempt the sheep into places where they would have to be rescued with ropes.

During the Great War, there was an army camp near to Loch Ard, and here milking goats were kept. When the camp was disbanded, these goats were liberated, and were said to have joined the herds on both Ben Venue and Loch Lomondside (Ben Lomond).

It was Gibson's view in 1972 that although small groups of goats were then to be seen in the Loch Ard area, they did not seem to remain long in the one place, and were thus presumed to be travelling between Ben Lomond and Ben venue. This led Gibson to believe that such sightings could hardly be described as a separate colony near to Loch Ard. Gibson encountered no goats in the Loch Ard area in 1971, and the recent reduction of goats on Ben Venue convinced him that it would become rare for travelling parities of goats to be seen in the Loch Ard area.

## **DESCRIPTION**

### **Horn type and colour**

During the late 1960's at least, the general horn type was "dorcas" on Ben Lomond (Greig, 1970). Two colour types in horns were found on Ben Lomond, dark brown or black in coloured goats, and translucent pink or amber in dominant white goats.

### **Horn length and size**

According to Whitehead (1972), an eight-year-old a billy shot at Rowardennan by D. Barry in September, 1951, had horns with the following dimensions: a length of thirty-two

and three-quarter inches, a circumference at the base of seven inches, and a span, tip to tip, of thirty-three inches. Barry also shot a nine-year-old billy at Rowardennan in July, 1958, whose horns had a length of thirty-six and three-eighths inches, a circumference at the base of seven and one-eighth inches, and a tip to tip span of thirty-nine inches. Prior to that, in 1947, Barry had shot another eighth-year-old billy at Rowardennan with horns thirty-one inches long, a circumference at the base of eight-and-one-quarter inches, and a span, tip to tip, of twenty-eight-and-one-quarter inches. Prior to the extermination of the Ben Venue goats, W. Joynson shot, in 1937, a seven-year-old male with horns that were 28-and-one-quarter inches long, and with a tip to tip span of twenty-nine inches and circumference around the base of seven-and-nine-sixteenth inches. Six years later, in 1947, Joynson had shot an eighth-year-old billy at Inversnaid with horns thirty-one-and-a-half inches long, a circumference at the base of eight-and-five-eighths-inches, and a span, tip to tip, of thirty-one inches. Lastly, Barry shot an eight-year-old billy on Ben Lomond in 1956 that had horns thirty-three-and-one-half inches long, with a circumference at the base of seven-and-five-eighths inches long and a span of thirty-five-and-one-half-inches.

The average horn length of these six billies, ranging in age between seven and nine years, is 32.75 inches, and the mean 32.75 inches. The average circumference at the base is 8.8 inches, and the average span, tip to tip, 32.7 inches.

These measurements were compared with those of twenty-four feral goat males that were trophy shot from a wide range of other Scottish feral goat populations (all quoted in Whitehead, 1972). The Loch Lomondside goat trophies were not significantly different, the Scottish feral goat trophies in general having an average length of 32.8 inches, compared to 32.75 in the Loch Lomondside goats; the circumference being on average 7.8 inches compared to 8.79; and the span an average of 33 inches compared to 32.7.

### **Tassels**

Greig (1970) noticed that six out of a total of thirty goats he watched on Ben Lomond in 1969 had tassels, and when, on the 12<sup>th</sup> August, 1969, twenty-five were captured, he found tassels on six.

### **Colour and colour pattern**

Two, out of a total of fourteen goats seen on Ben venue in 1932, were black.

Greig (1970) stated that ten percent of the Ben Lomond goats were pure white and that piebald goats were very rare. He described most of the Ben Lomond goats as being Toggenburg patterned except for the belly, which was usually white. What Greig termed Toggenburg pattern (technically "Swiss markings" or "Swiss patterning") is dark-bellied, and Greig called the patterning he encountered on Ben Lomond "modified Toggenburg" as the goats were white-bellied. Greig described one family group on Ben Lomond as consisting of an old white nanny, and a yearling white nanny with her pure white kid. He also mentioned

that in early 1968, the only white billy in the herd at that time died; whilst in February of 1969, he removed a brown nanny kid with Toggenburg markings plus a white belly from her pure white mother. Greig went on to speculate that if the white is dominant and the brown hypostatic, then this nanny must have been heterozygous in respect of white and modified Toggenburg. "Her kid must then have been homozygous in respect of the genes for the modified Toggenburg pattern." Greig's conclusion is mentioned in particular because he went on to state that "in this respect, the Ben Lomond goats are valuable stock for the determination of coat colour genetics, as about 90% of them fall into one of the two basic colour patterns", presumably meaning dominant white and dark-bellied Swiss patterning, again presumably meaning brown colouring. That not all the goats were dominant white at this time was demonstrated by Greig's further comments that on Ben Lomond, the white billies could be overshadowed by a sooty tint. He mentioned a male, which he named "Jid", that when he picked up for examination in May, 1968, was pure white from birth. This goat subsequently developed a sooty colour on the face, shoulders and spine as the summer progressed. Greig's interpretation of this was that billies tend to be darker than nannies in the same herd, and thus the darker "shadow" on the white Ben Lomond males may be an "example of this tendency", presumably being a form of sexual dimorphism. What Greig described, however, was a perfect example of the colour pattern "black mask", an allele (Abm) in the agouti series that produces a near-white phenotype with a dark (black) dorsal stripe, black face mask with white stripes, and a dark spot on the brisket. Black mask is recessive to pure white, but dominant to the Toggenburg brown as the white of black mask is really a dilute tan. That the ten percent of goats described by Greig as being "pure" white were likely to have been so has been confirmed by his comments on horn colour. He found a dead billy on Parmigan Hill, Ben Lomond, in May, 1968. This animal had translucent horns and the remains of a white coat. The horns of goats with pure white coats are translucent pink or amber coloured rather than dark brown to black because the dominant white is a lack of pigment rather than a dilute tan. This applies also to pied goats (white mismarking), and in which a horn could even be striped translucently if white touches onto that part of the horn.

Two kids photographed in the 1960's were black with grizzled roaning (see Loch Lomond under origin and history). Pure white goats were seen in 1972.

During the nineteenth century, the Ben Venue goats were described as being mostly a light grey with some dark brown.

The Inversnaid population was stated in 1992 (Hellowell, 1994) to vary considerably, ranging from totally white animals to entirely black ones, with all manner of grey and brown occurring in between.

#### Size and weight

W. Joyson, who shot billies before and during the Second World War, told Whitehead (1972) that he shot a billy in 1937 in Corrie Na Urisgean, on Ben Venue, that weighed

an estimated three-hundred-and-eight pounds. Richmond (1955) suggested that the Ben Lomond goats weighed up to three-hundred-and-fifty-pounds. Whitehead himself, whilst acknowledging that there were undoubtedly larger than average goats in the Ben Lomond district, was sceptical that any reached two-hundred-and-eighty pounds. He commented that the best goat reported by the keeper, George Jones, at Rowardennan, on the southwest face of Ben Lomond, weighed one-hundred-and-seventy-three-pounds. Jones also commented that, in his opinion, there would be few goats over one-hundred-and-sixty-eight-pounds. Whitehead himself went on to point out that if two-hundred-and-eighty-pound goats did then exist on the Lomond hills, it would surely have been an indication of very rich feeding and the deer would likewise have benefited. This, he pointed out, was not the case, as the deer weighed about the average.

Hellowell (1994) had no biometric data for the Inversnaid population, although he concluded, from subjective observation, that it comprised animals that were smaller in size than those found in other populations. The primary reason for this was thought to be the relatively poor food supply in the area, together with the relatively young age structure of the population. Elsewhere in his study, Hellowell discussed the way in which size and body weights in British feral goat populations differed, and that whilst this might be in part due to differing origins, evidence from other research suggested that the principal cause was varying environmental conditions. This led on to the conclusion that the relatively small body size of the Inversnaid goats was due in part to the shorter growing season encountered in this area, resulting in a relatively poor supply of food, especially in the winter. To this end, he thought that population density may also effect body size, the Inversnaid goats then having a high-density rate. Hellowell then quoted Welsh studies that appeared to contradict this research finding, adding "this observation casts some doubt on the above theory.

#### Coat

Coat length in the Inversnaid population is said to vary (Hellowell, 1994), although it was, generally speaking, longer in males than in females.

### ANALYSIS AND DISCUSSION

Possibly the oldest record of feral goats in Britain actually appertains to the Inversnaid area, this being a reference to the fourteenth century story linking Robert the Bruce to feral goats at that time.

Although reference to feral goats at Inversnaid in the fourteenth century is not the oldest- feral goats being recorded in the tenth century in southern England, this record pertaining to the new Forest, the source being the *Doomsday Book*- the reference referred to must surely be amongst the earliest recorded for the British Isles.

Feral goats would not have been tolerated in the Loch Lomondside area between around 1700 and 1920, the period when the woodlands were intensively managed for timber, charcoal, and tanbark. This view is inaccurate on

historical grounds, it being recorded that the Ben Venue goats were in existence in the early part of the nineteenth century, and had a recorded and continuous history up to and well beyond 1920. Goats were actually introduced into the Inchlonaig area in the eighteenth century, and there were herds in both the Loch Ard and Glen Falloch areas towards the latter part of the nineteenth century. Lastly, local knowledge placed feral goats on Ben Lomond itself in the nineteenth century, the very fact that the goats came close to being exterminated around the turn of the twentieth century being an indication in itself of their existence in the nineteenth.

It is probable that the present day feral goat herds originated around the turn of the twentieth century. This assumption is probably based at least in part on the previous one, which has been shown to be erroneous, and possibly also to the local references pertaining to the fact that there were "only a few" feral goats in the Loch Lomond area at the end of the nineteenth century, this population being re-established by the introduction of local domestic stock (Inversnaid and Frenich) by either escape or liberation. It is clear that this population did not die-out completely, and that in other areas of Loch Lomondside there were populations that were also old-established at the turn of the last century.

Milking goats were liberated to join the Loch Lomondside herds at the end of the Great War, and at least three domestic animals were introduced to the Inversnaid population during the 1980's. There is good historical evidence for this from more than one source.

There is no reason to believe that the Inversnaid population is any more or less pure than any other feral goat populations. The reasoning behind this hypothesis was not discussed, although it is assumed that it was based on one or both of two assumptions mentioned in the same paragraph of the text. The first was that pelage patterns offered little evidence with regard to the origins of feral goat populations; the second that domestic escapees revert to a wild type in a very short space of time and to the point at which it is virtually impossible to recognise domestic links in a matter of ten years. The argument would therefore appear to be that feral goat populations are subject to introgression at unknown and varying rates, and that there is a levelling process that renders it impossible to discern these domestic links in the phenotype in a very short space of time. It is therefore impossible to assess the degree of introgression that may or may not have taken place, and thus equally impossible to make any judgements with regard to the purity of any particle population in comparison with another. The refutation of this view will be considered under the next two headings.

When introgression occurs, it is impossible to recognise domestic links in a very short space of time, it being regrettable that pelage patterns offer little evidence as to the origins of feral goat populations, or indeed as to the length of their existence.

This assertion relates to the introduction of Modern goat stock into an already established feral goat population of the Old British type (when introgression occurs). Its basic

tenet is that the characteristics of Modern goat stock, which are recognizably different from those of the Old British goat, are absorbed into the feral type (impossible to recognize domestic links) in a very short space of time. The consequence of this is that pelage patterns would offer little evidence of either the origin or antiquity of the Inversnaid feral goat population.

Eleven basic colour patterns have generally been recognized in the goat, with a further one identified by the present writer more recently (Werner, 2003). Of these, two are found in goats of Swiss origin—no pattern white/tan and Swiss patterning. It has yet to be established that no pattern white/tan is found in the old British goat, whereas Swiss patterning is definitely not found in it. It would therefore be possible to detect the presence of Swiss breeding in the Inversnaid population by colour patterning, no pattern white/tan being the top dominant for colour, and Swiss patterning the top dominant for patterning.

With regard to the Loch Lomond goats generally, there may have been some confusion with regard to the type and extent of Modern Swiss influence both historically and more recently. Greig (1970) described white in the Rowardennan group, but mentioned also a white kid that developed the markings typical of the black mask patterning. He also described a colour pattern as being Toggenburg with a white belly. "Toggenburg" is Swiss patterning with the usual black pelage colour replaced by light brown at the brown locus. It has a dark belly. Greig's light-bellied "Toggenburg" may therefore have been a co-dominant cross between a Swiss pattern with the light brown allele and a lightbelly pattern, which gives a typical Swiss pattern with a white belly as described by Greig. Alternatively, this colour type could have been a typical lightbelly, which is black with striped legs, white belly, rump and facial markings that have the light brown allele. This brings us to the Inversnaid goats, which have been described as being commonly like the British Alpine in colour and patterning. No goats fitting this description have been seen at Inversnaid, although the most common colour pattern there was lightbelly. It is therefore possible that there is confusion between these two colour types. Other colour patterns seen at Inversnaid were Bezoar and grey lightbelly, the latter often being associated with darkbelly. "Pelage patterns" therefore tell us quite a lot about the origin and antiquity of the Inversnaid goats: which is that they are firmly based in colour types typical of the Old British goat but not found in the Swiss-based goats of the British Isles.

Pelage (colour and colour patterns) has to be taken in conjunction with other characteristics such as ear type, head shape, overall conformation, size and coat type, to make an assessment of origin, antiquity and breed type. In the case of the Inversnaid goats, these characteristics taken together would suggest that the group originated from the Old British breed, suggesting a history prior to the 1920's, and that there has been some introgression in the past. A mature male with typical Swiss patterning was seen at Loch Ard, however, which fits in with the known history of that population.

As suggested by Darling (1937) feral goats will revert to a "wild type" in a very short space of time. There are four main issues relating to Darling's theory of a reversion to a wild type when domestic goats go feral. These are:

- What did Darling mean by his term "reversion to wild type"?
- What did he consider to be the mechanism for such a reversion?
- What evidence did he offer to support his theory?
- How has Darling's theory been interpreted subsequently by researchers?, leading on to a consideration of the way in which the origin and status of the British feral goat has been viewed in the light of this.

Darling's theory on reversion to wild type in domestic goats newly gone feral was published in his supplementary paper to Hugh Boyd Watt's article entitled "On the Wild Goats in Scotland", published in 1937. Entitled "Habits of Wild Goats in Scotland," the relevant section is worth quoting in full:

The goat is an able fellow and can go feral with no difficulty and in a very short time. The reversion to wild type is rapid and ten years can make a big difference in the general appearance of a herd. What, it might be asked, is the influence on nitrogen metabolism which makes feral goats run increasingly to hair and horns until the standard of the wild goat is reached? Natural selection must be a potent factor in levelling the type of goats newly gone feral. The breeding season is early and kids appear frequently in late January and February, which is no time for young things to appear in the West Highlands. This early breeding season serves as an extremely fine mesh sieve in preserving only those which suit the conditions. I have no figures on actual kid-rearing percentage in "wild" goats, but it must be small. This tends towards a stable population and it is worth remarking that the goats are distinctly local in their distribution, and there is little if any evidence of spread or extensive migration.

So, what did Darling actually mean by the term "reversion to wild type"? It is clear that he believed that all established feral herds were characterised by long hair and long horns, and that hair-length and horn-length was consistently longer than that found in the domestic goat under domestic conditions, hence his use of the term "standard of the wild goat". Reversion to the wild type therefore meant the consistent way in which domestic goats going feral underwent an increase in hair and horn length, and that there was a standard, in terms of length, that was consistently reached. Does this imply, therefore, that Darling considered longhaired and long-horned feral goats to have originated from shorthaired and smaller-horned domestic stock? The answer to this question is clearly no, and for reasons found elsewhere in the article and its supplement.

Darling's views on a reversion to wild type were based largely on what he called the "fine herd of pure white goats which lives on An Teallach, the precipitous mountain near my home". He called this group a modern example of goats going wild, and stated that they were very wild

indeed, even although the foundation stock of this herd had been owned by a crofter on the shores of Little Loch Broom as recently as ten years previously (hence his comment that "the reversion to wild type is rapid and ten years can make a big difference to the general appearance of the herd"). Watt mentioned that the crofter on the north shore of Little Loch Broom kept goats "of the wild type", and Darling himself stated that the crofter "who keeps goats of the wild type" on the north shore of Little Loch Broom had begun recently to catch up the bucks at the beginning of August and to keep them penned until November in order to overcome the early kidding problems. Relevant to this is Watt's further comment that at Kildonan (Badrallach) there was a flock of about forty goats owned by a shepherd, and that these were "indistinguishable from wild goats." All this would suggest that both Darling and Watt were perfectly well aware that domestic stock in Wester Ross as late as the 1930's was of the same type, including general hair-length and horn-length, as the feral goat or "wild type." Also, when Darling commented on the way in which the An Teallach goats had run to hair and horn until the standard of the wild goat was reached, he was perfectly aware again that the foundation stock for this exemplary group of the wild type had originated from a flock that itself was of the so-called wild type.

What, we may then ask, was reversion to wild type all about in the An Teallach group? Watt described the An Teallach goats as the most magnificent of their kind that Dr. Darling had ever seen. They had strong horns of a wide spread, very long thick coats and exceeded in size any other wild goats in the west. There were, even so, only ten to a dozen of them, and this after they had been feral for a decade. The herd composition, according to Darling, was one mature buck, yearling bucks and half a dozen nannies and their kids of the year. How a herd composition of this type came about in ten years is open to question, although given the possibility that the foundation stock comprised, say, one male and two females, all two years old; that the fertility rate was a consistent 0.5 and the ratio of male to female kids was consistently 1:1; that females bred firstly in their second year and until their eighth year; that the foundation stock was all dead by 1937, and that no major accidents or disasters befell the group, the likely population structure of the An Teallach goats after their first ten years of existence would have been five mature males aged two, four, five, six and seven, plus one yearling male; six females, aged two, four, five, six and eight, plus a yearling female, and three kids. The actual population dynamics of the group, as quoted by Darling, fits this model quite well with regard to females and kids, although one wonders what had been happening to the bucks over the years. Given this model, in conjunction with the actual make-up of the group, it is possible to assume that the one mature buck was likely to have been the son of the original male, and that there were up to five generations of mature females, mother to daughter. Given the foregoing, the sample of two males and up to five females is very small in terms of assessing an overall increase in hair and horn-length over a restricted period of time of a decade, and although the goats had taken themselves above the peat line and to the highest reaches of the mountain at over 1700 feet, implying more severe weather conditions than the balmy shores of the loch, it could equally be argued that the foundation stock



and restricted bloodlines may have had equal bearings on the way in which the herd was developing over the period. What Darling was implying by his term "reversion to wild type" in relation to an increase in hair and horn length to a wild standard must therefore be viewed in the light of Darling's knowledge that domestic goats in the West Highlands were indistinguishable from the feral type, and the group in particular that he used for his limited study originated from domestic stock that was well-known to him and already of the "wild type" before they went feral.

When considering Darling's mechanism for reversion to wild type, it should be noted that he made two separate comments on this. He noted, firstly, that goats will go feral very quickly and with no difficulty, and that it was an "influence" on the nitrate metabolism that triggered increased hair and horn growth, once they had. Darling therefore ascribed the changes in hair and horn growth to a chemical process within the organism, and one that would have affected the synthesis of the proteins, carbohydrates and fats that form tissue and store energy. But what conclusion did he reach with regard to "the influence" itself? His immediate answer was "natural selection". Natural selection was the potent factor that levelled the type in goats newly gone feral, meaning that survival of the fittest meant that only the fittest survived, the ultimate criteria for which was the fittest having longer hair and horn length.

Did he then mean that levelling out targeted the pre-existing stock over a period of time (adult mortality) or subsequent generations (passing on the best suited characteristics)? The latter, it would seem (although he viewed the process as rapid) for he immediately went on to discuss the early breeding season of the feral goat. The early breeding season was a "fine mesh sieve" that preserved only those kids that were most suited to the (weather) conditions. What we have, therefore, is the assumption that when goat stock goes feral, the adverse weather conditions during early kidding result in only those kids best suited to live in such conditions surviving; and that such kids are presupposed to have a metabolism that runs to longer hair and longer horns than is the usual standard for both those kids that tend to survive to weaning and those that don't. Darling did not, of course, discuss the issues around the heritability of all this, which is to say why characteristics that develop only in later life have such an impact on survival at the kid stage of development. His case would appear to rest on whether or not the An Teallach group had been in existence for long enough for natural selection to have weeded out those adults that were less suited to life on the bleak and exposed mountain top, i.e. those with thinner coats and less cashmere, allowing those most suited to the conditions to pass on their more suited coats to subsequent generations.

Unfortunately, Darling himself never made this case, and made no attempt to explain how or why the inherited potential to develop longer hair and horns would have such a marked effect on whether or not a goat survived the first few days of its life. Most certainly it is the case that a shorthaired goat may well develop a six-inch coat in adverse weather conditions, but the foundation stock of the An Teallach group were already long-haired at the time of their liberation, and even had they not been, the increase in

hair-length would have been of a noticeably different type and texture to the coat of a genetically long-haired animal. Lastly, it should be noted that the crofter's domestic goat stock at nearby Loch Broom, had a similar early breeding season to the An Teallach group, this causing early kidding problems that needed to be overcome. This being the case, there should have been nothing unique about the early kidding in the feral goats, and any natural selection being exerted on the ferals would have equally been exerted on the nearby domestications, another way of making the point that had Darling's mechanism for a reversion to a wild type existed in the way in which he defined it, it would have been operative before the goats went feral, thus denying any link to the process of "going wild".

The actual reference to "reversion" is an interesting one, as the obvious question is reversion to what? The genuine wild goat is shorthaired, and it has been pointed out already that Darling meant the Scottish feral goat when he alluded to a "wild standard". The best explanation of what Darling meant when he used the term is therefore the idea that goats going feral begin to look more and more like goats that are already feral until they look exactly like them, and that it is the conditions under which they are feral that makes them ultimately all look alike. Although this is the only reasonable interpretation of the meaning behind Darling's concept of a "wild type", he actually denied its validity when he made it clear that he understood that the standard of the wild type existed in domestic stock even before it had the opportunity to go feral.

Despite the fact that Darling had observed the development of a feral herd over ten years, he maintained that he had no actual figures for kid-rearing percentages in wild goats, and also made comments on the behaviour of feral goats, based on the An Teallach group, that were inaccurate (herds are patriarchally led; males remain with the females throughout the year; yearling bucks remain on the outskirts of the group; herd composition is one buck and half a dozen nannies).

Summarizing Darling's theory on reversion to wild type, it is clear that it was based on limited observation, and that at best its interpretation is that already long-haired and long-horned domestic goats, of what he called the wild type but in domestication, might develop coats and horns that are longer still if they are allowed to go feral.

Moving on to the way in which Darling's theory has been interpreted, it has mostly been taken to mean that if goats of any breed or type, or a mixture of any breeds or types, are allowed to go feral, then they will rapidly revert to a uniform and recognisable type which is long-coated and longer-horned. Often this is stated in derogatory terms, for example "little, course-horned and hairy", and pedigree goat breeders have tended to interpret the term reversion, in this context, as their fine pedigree stock reverting to a useless and non-pedigree scrub type of goat almost as soon as the refinements and blessings of Herd Book status and regular supplements are denied them. Indeed, it was reported recently that feral goats "are just mongrels...that are kidding at a year old and, no doubt, carrying a worm burden and often fluke as well" (Whiteside, 1998). Obviously, if Darling's theory had been demonstrable from

the evidence he offered, and a mechanism for its working convincingly presented, then a case would have been made for believing that "reversion to wild type" adequately explained why feral goats tended to have a predictable phenotype, and there would be no need to look beyond a *pot pourri* of domestic escapes of modern type to explain their origins. As it stands, Darling was unable to do this, and his theory was refuted as long ago as the late 1960's (Werner, 1967; Greig, 1970), although this has not stopped innumerable writers and researchers alluding to it as an assumed fact in the intervening thirty-odd years.

Lastly, little thought seems to have been given to the fact that feral goats are not universally longhaired, the standard varying between rough and thick-coated to long hair in the females and long hair in the males. What marks a feral goat of the Old British type out from the modern breeds, be they the ferals of today or the now extinct domesticants of yesteryear, is the type and texture of the coat. Not only does it appear different visually, but also is notably different when handled. Therefore, had Darling's hypothesis been viable, feral goat populations would have universally comprised longhaired animals.

Neck tassels are present on some Inversnaid animals, and many consider this feature to be indicative of more recent feral goat populations.

Tassels are generally associated with the Swiss breeds, including their British derivatives- British Saanen, British Alpine and British Toggenburg. It is therefore quite usual to consider the presence of tasselled goats in a feral population to be a good indicator, usually recent, of introgression with domestic stock of improved Modern type. The situation is a little more complex than this, however.

There is some indication that our Old British stock was tasselled, albeit rarely. Greig (1970) dealt with the matter of tassels in some detail, concluding that the references to tassels in English publications were based on translations of Continental works, where tasselled goats are not at all uncommon. Whilst this is certainly true, the present writer has come across a painting in the Museum of Canterbury by Thomas Cooper, the famous Kent artist who specialized in sketching and painting livestock, that shows a Welsh feral herd on the run. The dating is the 1840's, and whilst the goats themselves are faithful representations of the Old Welsh goat, a female is tasselled. The idea that the Old British goat could be tasselled cannot therefore be dismissed.

What should be taken note of, even so, is that a general study of nearly 1000 feral goats to date has indicated that tassels are universally absent in populations in which there is no indication of introgression, whilst tassels are present in some populations that show other indicators of introgression with Modern goat stock. This would suggest that tassels are likely to be a general indicator of introgression in the surviving feral populations of Scotland.

That the presence of tassels is also a good indicator of the *recent origin* of a population is also open to question. It is unlikely that goats of Modern type had the opportunity to enter the Scottish goat stock gene pool prior to the early

twentieth century, filtering out into feral goat populations from the 1920's onwards. A population of rank antiquity, say one with a pedigree in excess of 150 years, might have had some introgression with domestic stock 80 years ago, the presence of tassels in this case being no indication of a 'recent origin'.

Lastly, tassels are a simple dominant, so that its presence in a feral population may be out of all proportion to the amount of introgression that has occurred, i.e. the introduction of only one billy of Modern type into an established population might have left a greater legacy of tasselled descendants than any other characteristic. In the case of the Inversnaid goats, tassels may be present, but the overall characteristics of the animals would indicate that they originated from Old British stock with a later, but minor, influence of goat stock of an improved type. In this case, therefore, the presence of tassels only serve to confirm what is otherwise known, and offer no evidence as to a recent origin for the population.

### GENERAL CONCLUSIONS

It is quite likely that feral goats have occurred in the Loch Lomondside area since the fourteenth century, and there is no reason to believe that they were not tolerated there between the seventeenth century and the 1920's. A continuous history is therefore likely.

Given the historical evidence, the present stock would have originated during a period when only the Old British breed was known in the Stirling area, and earlier descriptions and trophy hunted heads confirm this. Also, goats seen at Inversnaid conformed to the basic breed type of the Old British goat.

It is known that goats of the Modern type were introduced into the feral populations of Loch Lomondside at various times during the last century, and, once again, there are indications of some introgression in the Inversnaid stock.

Much reliance has been placed on Darling's theory that goats will revert to a wild type in a very short space of time, which has been found to be erroneous, and that pelage patterning is of no use in determining the origin and antiquity of feral herds. This has confused the issue, and led to the conclusion that it is impossible to determine from what type of goat the present Loch Lomondside population originates, and how long it has been there. A study of the breed type and colour patterns of the Inversnaid goats in particular, however, has been helpful in confirming the accuracy of the historical account and linking this with the present goat population. Consequently, the Inversnaid goats in particular are living history, and a valuable gene bank in terms of preserving a remnant of the Old British Breed of goat.

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